Sequential brush biopsy and conventional biopsy: direct comparison of diagnostic sensitivity in lung malignancy

J R W LYALL, G D SUMMERS, I M O'BRIEN, N T BATEMAN, C P PIKE,
AND M V BRAIMBRIDGE

*From the Departments of Medicine, Cardiothoracic Surgery, and Cytopathology,
St Thomas' Hospital, London*

ABSTRACT One hundred and sixteen patients with suspected lung malignancy who were referred for bronchoscopy were examined using both the flexible fiberoptic bronchoscope and the rigid bronchoscope. Both instruments were used sequentially under the same general anaesthetic. Brush biopsies were obtained through the fiberoptic bronchoscope and conventional biopsies, for histological examination, through the rigid bronchoscope. Both specimens were taken from the same area. Eighty-two per cent of those in whom there was a final clinical diagnosis of malignancy were found to have abnormal cytology via the fiberoptic bronchoscope, while abnormal histology was found in 50% by means of the rigid bronchoscope. For those in whom malignancy was confirmed, 16.9% showed disagreement between the two methods in cell typing. Brush biopsy through the flexible fiberoptic bronchoscope under general anaesthesia is confirmed as a sensitive method for diagnosing lung malignancy.

For many years, bronchial biopsy through the rigid bronchoscope has been a valuable technique in the diagnosis of lung malignancy. The material obtained allows for conventional histological examination. The sensitivity of this technique is established,¹⁻³ and may be regarded as a standard against which to assess new methods.

Brush biopsy, which provides material for cytological examination, has been performed through the rigid bronchoscope or with a flexible catheter.⁴ Since the introduction of the flexible fiberoptic bronchoscope^{5,6} however, brush biopsy has been advocated as a highly sensitive method of diagnosis.⁷ There is no published study comparing the diagnostic sensitivity of brush biopsy through the fiberoptic bronchoscope with conventional biopsy through the rigid bronchoscope carried out sequentially at the same examination by an operator experienced in both techniques. We have used both methods in a group of patients with suspected lung malignancy. The examinations were carried out sequentially under the same general anaesthetic and

the findings compared with the final clinical diagnosis.

Methods

The study was carried out on patients with suspected malignancy referred for routine bronchoscopy in the outpatient theatre at St Thomas' Hospital. All examinations were carried out under general anaesthesia, using a technique previously described⁸ which allows introduction of the fiberoptic bronchoscope through a diaphragm in the end of a cuffed endotracheal tube, whilst permitting ventilation through a side connection. An Olympus BF 5B2 fiberoptic bronchoscope was introduced and each segmental orifice visualised. Brush biopsy of the abnormal area was obtained for cytological examination. After brushing, the bronchoscope and brush were withdrawn as one, without retraction of the brush into the biopsy channel, and the brush was immediately rubbed on a microscope slide using a circular motion. The slide was immersed in 90% ethanol for fixing and transport to the laboratory. Forcep biopsy specimens were not taken with the fiberoptic bronchoscope.

After removal of the endotracheal tube, examination by means of a rigid Negus bronchoscope was carried out on those patients who had not presented an entirely normal appearance through the fiberoptic bronchoscope. Appropriate biopsies were taken with Brock biopsy forceps for paraffin section histological examination, from the same area which had been previously brushed with the fiberoptic bronchoscope cytology brush.

The diagnosis made using each technique was compared with the final clinical diagnosis.

Results

One hundred and sixteen patients were examined using both techniques. The age and sex distribution are shown in table 1. Of the 116 patients, 99 had a diagnosis of malignancy confirmed at follow-up. Of those patients with a final diagnosis of malignancy, 50 (50%) were detected by conventional

Table 1 Age and sex distribution of patients studied

	Patients	
	Male	Female
Number	90	26
Age range (yr)	18-76	48-79
Mean age (yr)	61	62

Table 2 Results of histology and cytology

	Malignant	Benign	Total
Final diagnosis	99	17	116
Histological diagnosis	50	66	116
Cytological diagnosis	81	35	116

Table 3 Bronchoscopic findings for the 99 cases of confirmed malignancy

	Number	(% total)
Both methods diagnostic	46	47
Cytology only diagnostic	35	35
Histology only diagnostic	4	4
Both methods negative	14	14
Total	99	

Table 4 Comparison of cell type obtained by cytology and histology

		Cytology				
		Negative	Squamous	Oat	Anaplastic	Other
Histology	Negative	31	18	4	8	5
	Squamous	1	27		1	
	Oat			4	7	
	Anaplastic	3	1		3	
	Other					3
		Both + 46				
		Cell type agrees 37		Cell type disagrees 9		

histological examination of biopsies obtained through the rigid bronchoscope, and 81 (81.8%) were detected by examination of the cytological preparations obtained by brush biopsy through the fiberoptic bronchoscope (table 2). Table 3 shows the combined and individual bronchoscopic findings in the 99 cases of confirmed malignancy. Table 4 shows the cell types obtained by each method. In the 46 in whom both methods yielded a positive diagnosis, there was agreement in 37. In nine a diagnosis of malignancy was made by both techniques, but the cell type disagreed.

Discussion

The present results confirm previous reports suggesting a greater sensitivity of brush biopsy over conventional biopsy.¹⁰ Previous studies have only compared the two techniques retrospectively in different groups of patients being examined by different operators. In the present study the same operator, familiar with both bronchoscopic methods, carried out the examinations sequentially on the same patient.

Although the fiberoptic bronchoscope extends the range of vision and biopsy,^{6,11} we included in this study only those patients in whom a biopsy could be taken through the rigid bronchoscope. We have, therefore, carried out a direct comparison of the sensitivity of the two biopsy techniques.

Cytological preparations can deteriorate rapidly and meticulous attention to detail when taking the specimen is most important. Our technique under general anaesthesia permits rapid withdrawal of bronchoscope and brush together, with the brush still protruding beyond the end of the bronchoscope. Harvested cells were smeared on to a glass slide with a circular motion and immediately plunged into fixative. We found that as little as 15 seconds delay between harvest and fixation could produce noticeable deterioration in cell quality on subsequent cytological examination.

Oswald *et al*² reported a sensitivity for rigid bronchoscopy of 50%. Webb and Clarke,¹² in a retrospective survey, reported positive biopsy rates of 51% for rigid bronchoscopy and 72% for fiberoptic bronchoscopy carried out under local anaesthesia, taking biopsy but not cytology specimens. When allowance was made for tumours outside the range of the rigid bronchoscope—that is, comparable to the present study—their positive rate for fiberoptic bronchoscopy was 47%.

The positive biopsy rate of 50% obtained in the present study using the rigid bronchoscope is in keeping with these previous reports. The much higher positive fiberoptic cytology rate of 82%

cannot be easily explained, as biopsy and cytology specimens were deliberately taken from the same abnormal area. It may be that cell harvest by brushing collects a sample from a wider area than forcep biopsy.

Comparison of cell types obtained by conventional histology and brush biopsy shows only moderate agreement, 20% yielding a different cell type. We have obtained confirmatory histology from operation or postmortem examination in too few of our patients to allow determination of the absolute accuracy for each method. This is clearly of importance, particularly in those patients for whom chemotherapy may be considered. We feel that the high sensitivity of brush biopsy using the fiberoptic bronchoscope under general anaesthesia makes this the diagnostic technique of choice for patients with suspected lung malignancy.

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